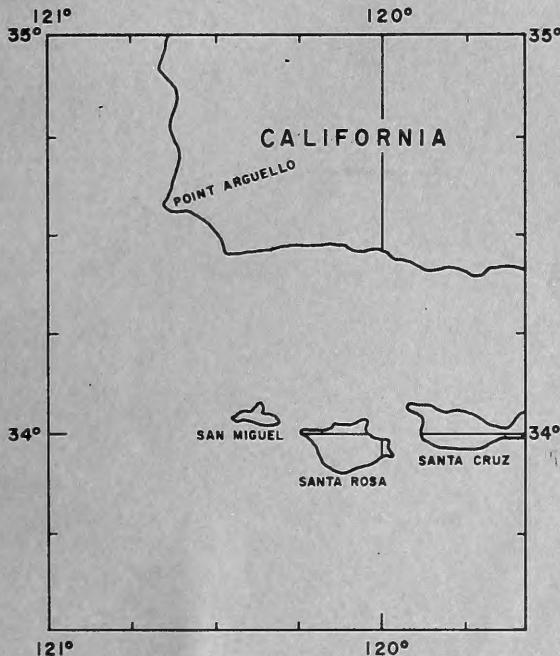




TR 201

TECHNICAL REPORT

OCEANOGRAPHIC SURVEY RESULTS OFF POINT ARGUELLO, CALIFORNIA
JANUARY AND NOVEMBER-DECEMBER 1964



FEBRUARY 1968



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NAVAL OCEANOGRAPHIC OFFICE
WASHINGTON, D.C. 20390

ABSTRACT

NAVOCEANO conducted two oceanographic surveys in the ocean area off Point Arguello, California, one in January and one in November-December 1964. The primary purpose of the surveys was to investigate the currents of the area; however, standard Nansen casts were taken, and bottom sediment and plankton samples were obtained.

Parachute current drogues were principally used to describe current movement off Point Arguello. A strong westerly flow along the northern portion of Santa Barbara Channel was noted in the surface layers. A corresponding easterly flowing current also was noted in the southern portion of the channel.

The major features of the surface flow appeared to be a counterclockwise rotating eddy just off Point Arguello and a deflection of the California Current due to the influence of Rodriquez Dome.

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FOREWORD

The ocean area off Point Arguello, California, offers an interesting environment for oceanographic study. The area is a region of interacting current regimes and water masses. NAVOCEANO conducted two environmental surveys off Point Arguello for the Pacific Missile Range in January and November-December 1964. The primary purpose of the surveys was to investigate the currents. This report presents some analyses of the data collected with most emphasis on the currents in the area.



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MBL/WHOI



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I. INTRODUCTION

The Naval Oceanographic Office (NAVOCEANO), conducted two environmental surveys aboard USS REHOBOTH (AGS 50) in the ocean area off Point Arguello, California, in January and November-December 1964. Both surveys were undertaken to provide oceanographic information to the Pacific Missile Range, Point Mugu, California. The primary purpose of the surveys was to investigate the currents of the area; however, standard Nansen casts were taken, and bottom sediment and plankton samples were obtained. Figure 1 shows the physiographic features of the Point Arguello area.

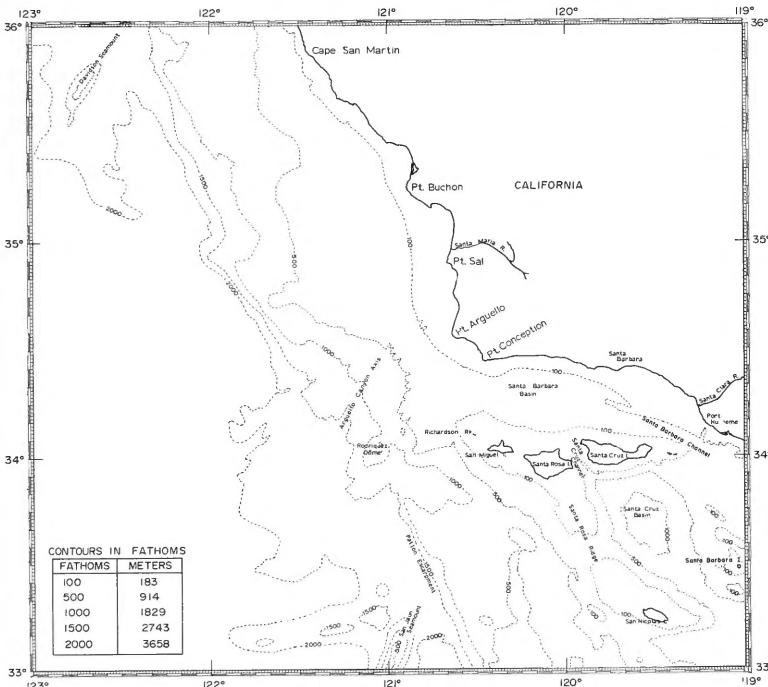


FIGURE 1. PHYSIOGRAPHIC FEATURES OF POINT ARGUELLO AREA

The ocean area off Point Arguello is quite complex as several North Pacific current regimes interact. It is a profound oceanographic and faunistic boundary between true Subarctic and Equatorial Waters. The area of the surveys is located inshore of the California Current system. This current system transports water southeastward from the West Wind Drift (off Alaska) to the North Equatorial Current (off Mexico). A subsurface countercurrent below 200 meters (660 feet) is present close to the coast throughout the year. As upwelling ceases in the winter and the character of the prevailing winds changes,

a surface countercurrent, the Davidson Current, develops. This Davidson Current flows northwestward along the coast within about 80 miles of the California coast.

Surveys of the California Current system, carried out under the California Co-operative Oceanic Fisheries Investigation (CCOFI) Program (Scripps, 1949-64), repeatedly touched the area covered by the 1964 surveys, but the sampling grids employed by CCOFI surveys were too coarse to delineate small scale features.

II. NARRATIVE OF OPERATIONS

A. January 1964.

REHOBOTH occupied 19 oceanographic stations along 5 lines radiating from the coast of California beginning 21 January (Fig. 2). From Nansen casts, serial-depth temperature and salinity measurements were obtained, and water samples were collected for analysis of salinity and dissolved oxygen, phosphate, and silicate. Additionally, 16 cores,

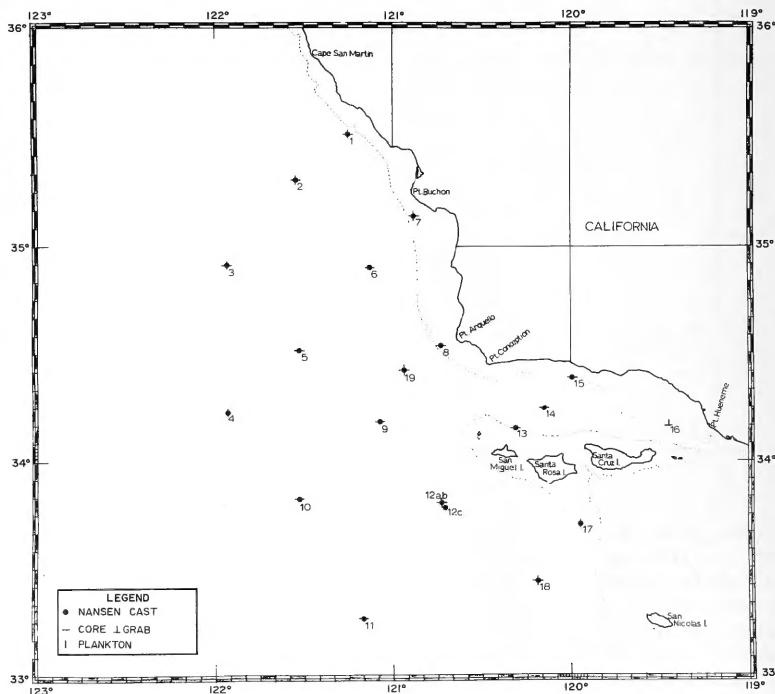


FIGURE 2. OCEANOGRAPHIC STATION LOCATIONS, JANUARY

2 parts of cores, 1 bottom grab sample, 27 bathythermograms (BT's), and 9 surface and 2 vertical plankton samples were collected on selected stations. A total of 274 drift cards was released. The observations made at each station are tabulated in Table I.

From 25 to 28 January, 19 parachute current drogues were launched and tracked.

B. November-December 1964.

REHOBOTH reoccupied the 19 stations taken in January between 25 November and 10 December (Fig. 3). Serial-depth temperature, salinity, and dissolved oxygen measurements were obtained with Nansen casts. Additionally, 10 cores and 4 surface plankton samples were collected at selected stations. The observations made at each station are tabulated in Table II. During this same period, 28 parachute current drogues were launched and tracked, and a total of 22 BT's was obtained.

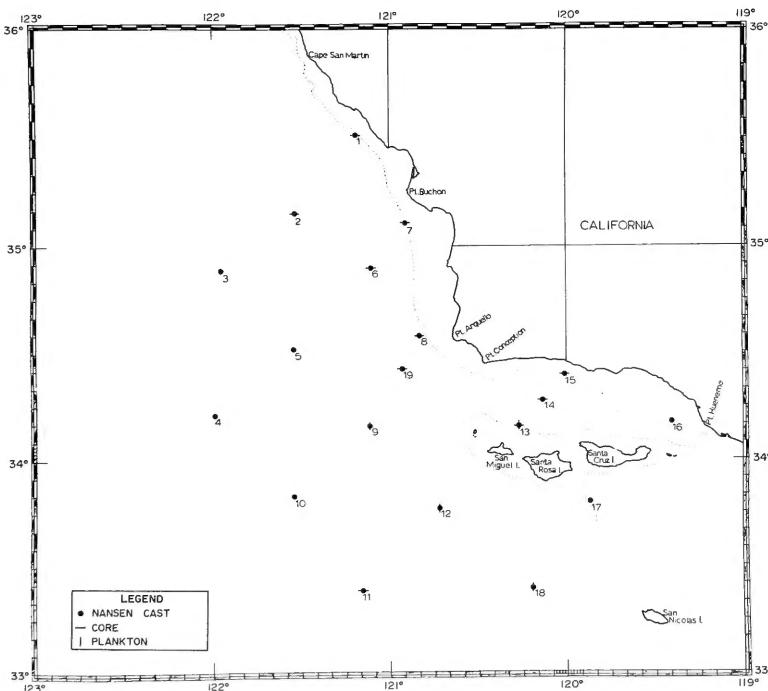


FIGURE 3. OCEANOGRAPHIC STATION LOCATIONS, NOVEMBER-DECEMBER

TABLE I. STATION SUMMARY
JANUARY

STATION NUMBER consec. assign.	SONIC DEPTH (Meters)	CAST DEPTH (Meters)	OXYGEN	PHOSPHATE	SILICATE	PLANKTON	BOTTOM SEDIMENT	IRIT CARDS	BT'S
1	333	291	+	+	+	Horz/Vert	KC1	10	2
2	796	443	+	+	+	Horz/Vert	KC2	10	1
3	2085	1308	+	+	+	Horz	KC16	26	3
4	3737	1604	+	+	+	Horz	KC3	10	2
5	2195	2071	+	+	+	Horz	KC4	10	2
6	550	486	+	+	+	Horz	KC5	12	2
7	132	99	+	+	+	Horz	KC6	12	3
8	102	70	+	+	+	Horz	KC7	2	2
9	896	733	+	+	+	Horz	KC8	18	+
10	1930	1442	+	+	+	Horz	KC9	10	+
11	3365	2702	+	+	+	Horz	KC10	10	+
12	1840	392	+	+	+	Horz	BS1	24	+
13	2015	477	+	+	+	Horz	BS2	10	+
14	175	100	+	+	+	Horz	KC11	14	+
15	530	357	+	+	+	Horz	KC12	20	+
16	214	210	+	+	+	Horz	KC13	10	+
17	23	293	+	+	+	Horz	KC14	14	+
18	15	170	+	+	+	Horz	KC15	19	+
19	120	250	+	+	+	Horz	BS3	20	+
20	1970	1343	+	+	+	Horz	BS4	14	+
21	17	1970	2947	2947	2947	Horz	BS5	19	3
		1120	3280	3280	3280	Horz	BS6	20	20
		137	782	782	782	Horz	BS7	125	17

TABLE II. STATION SUMMARY
NOVEMBER-DECEMBER

STATION consec.	NUMBER assign.	SONIC DEPTH (Meters)	CAST DEPTH (Meters)	OXYGEN	PLANKTON	BOTTOM SEDIMENT
1	16	70	60	+		
2	17	183	162	+		
3	18	1180	686	+		
4	12	1940	918	+	Horz	
5	11	3510	473	+	Horz	KC1
6	8	110	105	+		KC2
7	19	885	656	+		KC3
8	9	2000	1693	+	Horz	
9	10	3380	2941	+		
10	4	3594	3227	+		
11	5	2377	1816	+		
12	3	2290	1862	+		
13	2	568	490	+		KC4
14	1	254	200	+		KC5
15	7	146	139	+		KC6
16	6	545	489	+		KC7
17	13	366	238	+	Horz	KC8
18	14	530	341	+		KC9
19	15	77	60	+		KC10

C. Participating Personnel.

NAVOCEANO personnel participating in the surveys were as follows:

January 1964 Survey

G. H. Knoop (Senior Scientist)
R. P. Kopenski
R. W. Thomas
R. A. Stewart
L. S. Jordan

November-December 1964 Survey

R. W. Thomas (Senior Scientist)
R. K. Oser
R. M. Heavers
S. W. Dorey
L. S. Jordan

III. METHODS AND PROCEDURES

A. Instrumentation and Data Collection.

Serial-depth temperature, salinity, and dissolved oxygen data were obtained by standard Nansen cast techniques. Paired protected and unprotected deep sea reversing thermometers were placed on the Nansen bottles for in situ temperatures. Water samples were drawn from the Nansen bottles for chemical analyses.

On the January survey, water samples for dissolved oxygen, phosphate, and silicate analyses were drawn at the stations located within a 50-mile radius of Point Arguello. The phosphate and silicate samples were frozen for later analysis at NAVOCEANO.

On both surveys, temperature measurements were made periodically with mechanical BT's. BT data were forwarded to the National Oceanographic Data Center (NODC) for processing.

The bottom sediment samples were obtained by means of a Kullenberg corer and an orange peel sampler at the stations shown in Figures 2 and 3. The cores were protected against desiccation by coating the core liners in a specially constructed wax bath.

Surface plankton hauls (Figs. 2 and 3) were obtained with a half-meter net, mesh size #0, as the ship drifted on station. For vertical hauls, the same net was lowered to 200 meters and retrieved. The samples were preserved and shipped to the NAVOCEANO biological laboratory for analysis.

Parachute current drogues, with the parachute at either 50, 300, 500, or 1,000 feet (15, 90, 150, or 305 meters), were released and tracked. Positioning of the drogues on the January survey was by radar range and bearing. Because of new requirements on the ship's time, drogue observations were abridged. Drogue positions were determined chiefly by Lorac on the November-December survey, but, since Lorac coverage did not extend north of Point Arguello, radar was used for some positions.

B. Methods of Analyses and Disposition of Data.

Reversing thermometer temperatures were read to $\pm 0.01^{\circ}\text{C}$ and corrected by standard methods.

Salinities were analyzed aboard ship with a conductive salinity bridge during the January survey and an inductive salinometer during the November-December survey.

Dissolved oxygen concentrations were determined aboard ship using a modified Winkler titration method.

The phosphate and silicate samples were analyzed by spectrophotometric methods at the NAVOCEANO chemical laboratory. Unfortunately, the values obtained are questionable since the samples partially thawed during shipment. There is no discussion of these data in this report.

The physical and chemical oceanographic data were coded and forwarded to NODC for processing by electronic computer. Machine computations provided temperature, salinity, and dissolved oxygen interpolations at standard depths, in addition to density (σ_t), specific volume and dynamic depth anomalies, and sound velocity calculations. The phosphate and silicate concentrations at observed depths were added to the computation listings. Listings of these data are on file at NODC under cruise reference numbers 31268 for January and 31216 for November-December.

At the conclusion of both surveys the bottom sediment samples were shipped to the Bureau of Mines facility at Tiburon, California, where NAVOCEANO personnel analyzed them for engineering properties. Sub-samples were forwarded to the NAVOCEANO geological laboratory for sediment size and composition determination. Core analysis summary sheets of engineering properties and sediment size and composition are on file at NAVOCEANO under Laboratory Item 227 for January and Item 242 for November-December. The grab sample and the two parts of cores from the January survey were not analyzed. Log sheets of the bottom sediment data from both surveys are presented in the appendix. Since bottom sediment distribution has been amply covered by other works (e.g., Emery, 1960). The sediment data are not discussed in this report.

The BT data are on file at NODC under reference number 08382 for January and 08383 for November-December.

Results from the drift card releases have not been obtained.

At NAVOCEANO, the plankton samples were filtered through cotton cloth. The volume of each wet sample was read in a graduated cylinder and water added to the 100cc level. Aliquots of 2cc were drawn while stirring the sample. A sufficient number of aliquots were removed to include 4 to 20 percent of the sample, depending on the total volume of plankters involved. The type and number of plankters from the January and November-December surveys are tabulated in the appendix.

Parachute current drogue tracks were plotted and are included in this report. Average velocities were computed to the nearest tenth of a knot for each observation interval. Current drogue summary sheets are presented in the appendix.

IV. ANALYSIS AND RESULTS

A. Temperature.

During the January survey, surface temperatures were cooler offshore with the isotherms oriented almost north-south (Fig. 4). At depths below 100 meters (330 feet), temperatures decreased seaward with the isotherms paralleling the bottom topography. Figure 5 shows horizontal temperature distribution at 200 meters (660 feet).

A more complex, and essentially opposite, distribution of temperature developed during the November-December survey. Surface temperatures increased seaward with a lobe of cooler water extending south from Point Arguello (Fig. 6). Warmer water occurred along the northern side of Santa Barbara Channel. A similar pattern existed at 200 meters (Fig. 7). Station 9 exhibited anomalously low temperatures at all depths below 100 meters.

B. Salinity.

Surface salinities in January were higher nearshore with an ill-defined lobe of more saline water extending south and west from Point Arguello (Fig. 8). A small salinity range of about .02‰ existed below 100 meters, but generally, the lower values were to the south and east.

Surface salinities during the November-December survey decreased seaward (Fig. 9). The range of salinity values was again small below 100 meters, but higher values occurred in the Santa Barbara Basin and at the outer stations southwest of Point Arguello.

C. Dissolved Oxygen.

In January, dissolved oxygen distribution below 100 meters indicated a wedge of relatively low oxygen content water extending toward Point Arguello from the southwest. During the November-December survey, this same low oxygen wedge existed, although displaced slightly to the north. In the Santa Barbara Basin, low dissolved oxygen content values existed below sill depth during both surveys.

D. Currents.

1. Tides. A mixed tide with a mean range of 3.7 feet characterizes the Point Arguello area. The diurnal range is less than 5.4 feet, and the extreme range, attained during the spring tides of the solstices, is 8.8 feet (USC&GS, 1964).

The tide wave moves from southeast to northwest at such a rate that high tide reaches Point Buchon about 30 minutes after passing Port Hueneme. The associated currents theoretically reach their

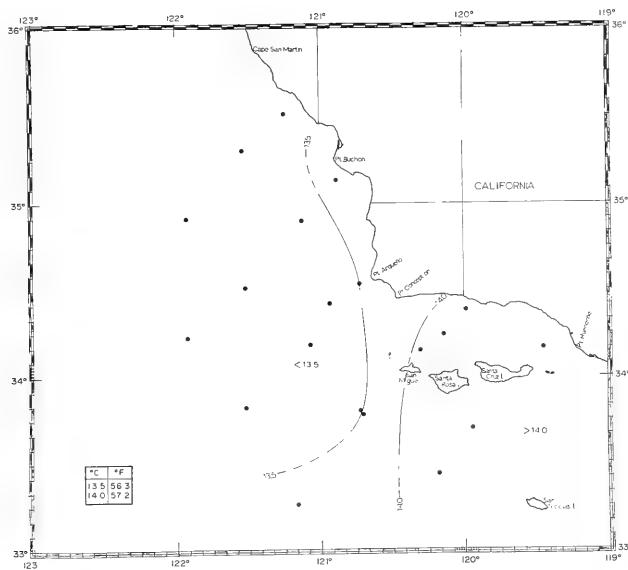


FIGURE 4 SURFACE TEMPERATURE DISTRIBUTION (°C), JANUARY

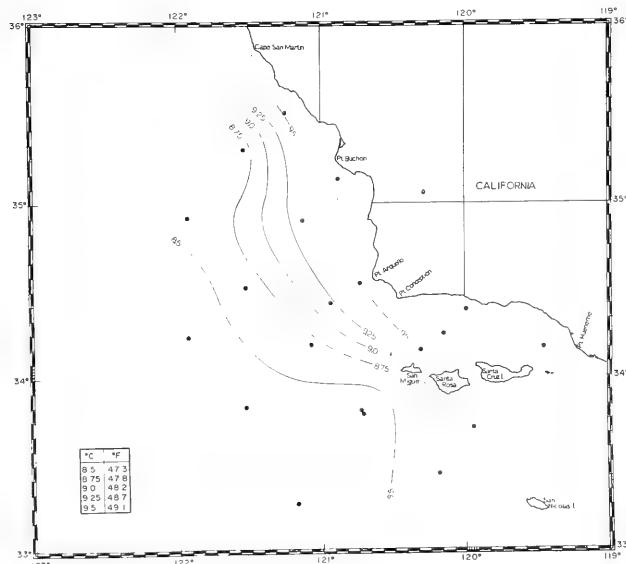


FIGURE 5 TEMPERATURE DISTRIBUTION (°C) AT 200 METERS, JANUARY

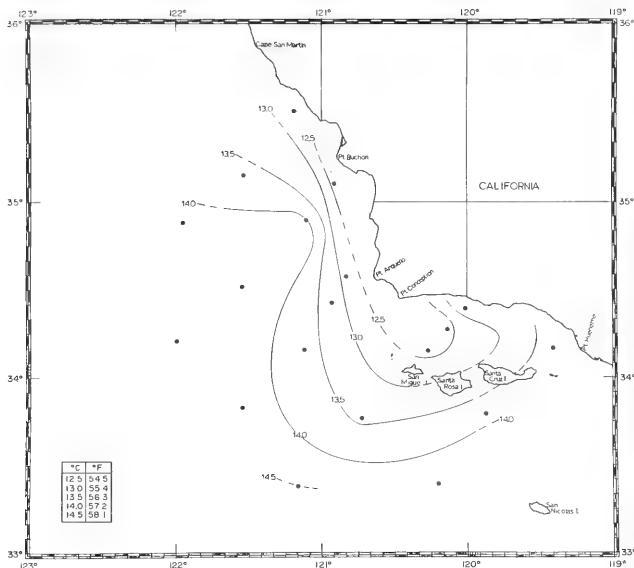


FIGURE 6. SURFACE TEMPERATURE DISTRIBUTION (°C), NOVEMBER-DECEMBER

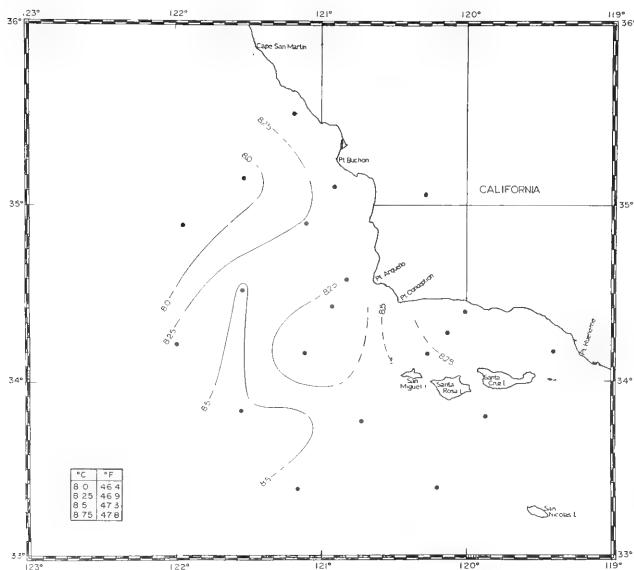


FIGURE 7. TEMPERATURE DISTRIBUTION (°C) AT 200 METERS, NOVEMBER-DECEMBER

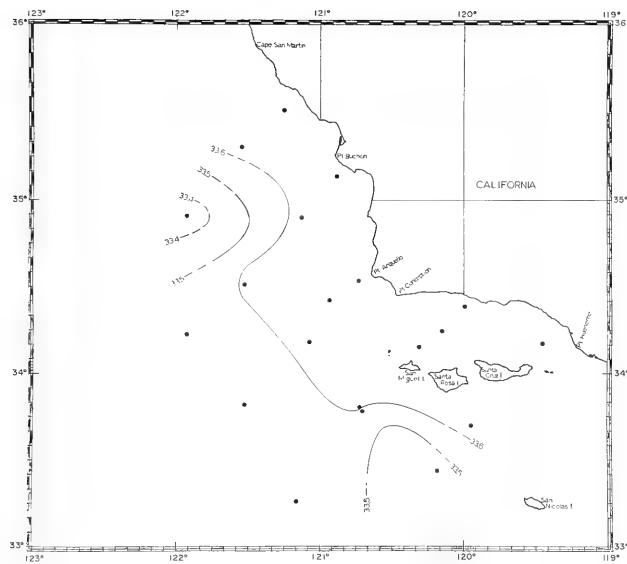


FIGURE 8. SURFACE SALINITY DISTRIBUTION (‰), JANUARY

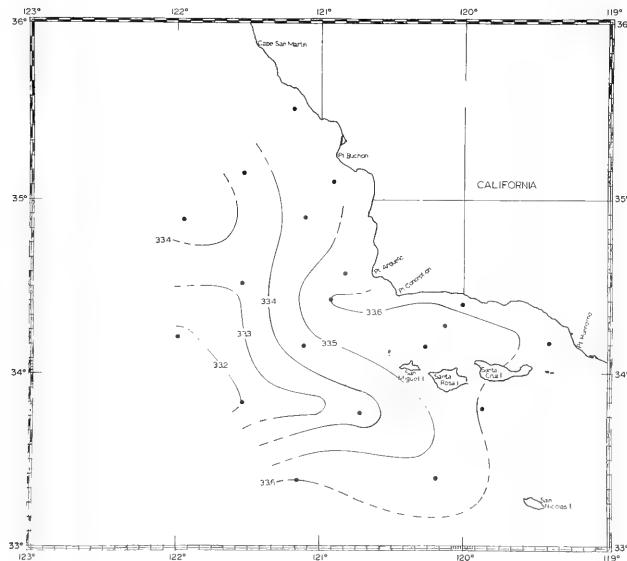


FIGURE 9. SURFACE SALINITY DISTRIBUTION (‰), NOVEMBER-DECEMBER

maximum velocities between high and low tide and rarely exceed 0.5 knot. On the open shelf, tidal currents are rotary in a clockwise manner and make a complete cycle in about 12.4 hours. Boundary conditions near the shore and at the bottom, however, confine the tidal current largely to directions parallel to shore or bottom contours.

2. Parachute Current Drogues. The tracks of the parachute current drogues released in January are shown in Figure 10. Twelve of the drogues had the parachute at 50 feet, four at 300 feet, and three at 1,000 feet.

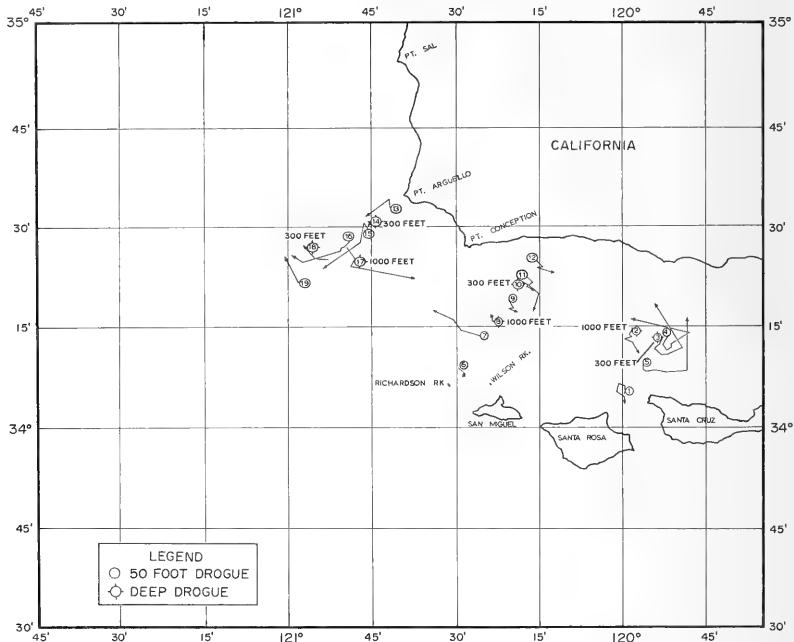


FIGURE 10. PARACHUTE CURRENT DROGUE MOVEMENT, JANUARY

The 50-foot drogues released in a line radiating southwest from Point Arguello indicated southwestward flow nearshore and a northerly flow near 121°W longitude. The 300-foot drogues followed a similar, but less pronounced, movement. The 1,000-foot drogue apparently lost its parachute and became influenced by prevailing winds.

The drogues along the northern entrance to Santa Barbara Channel revealed mixed flow directions. Those near the coast moved generally eastward, but they exhibited a period of westward flow, probably the

result of tidal currents. The drogues in the center of the channel entrance showed a westward outflow from the channel. The most southern drogue suggested a weak eastward flow.

In Santa Barbara Channel, north of Santa Cruz Island, the drogues revealed a counterclockwise, eddy-type flow. The drogue released near the entrance to Santa Cruz Channel showed a counterclockwise flow that was displaced into the channel.

The tracks of the drogues released during the November-December survey are shown in Figure 11. Twenty-two of the drogues had parachutes at 50 feet, one at 300 feet, and five at 500 feet.

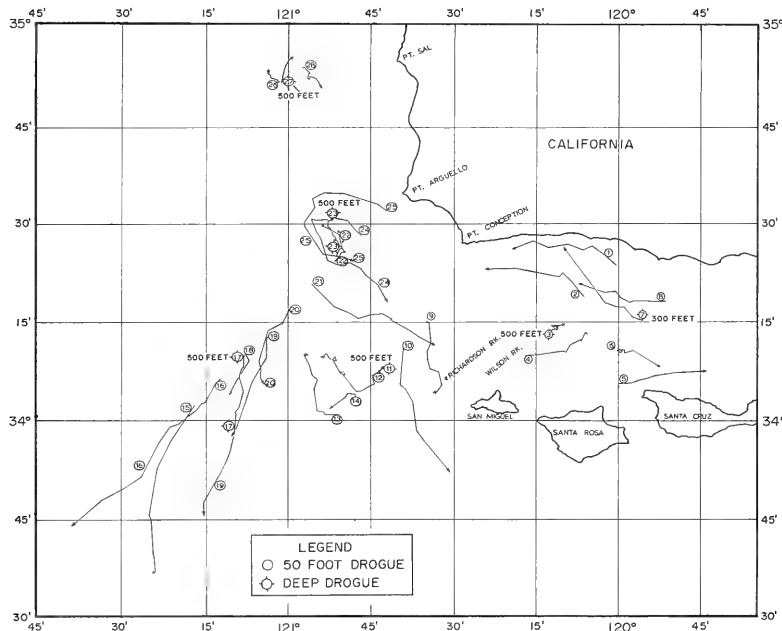


FIGURE II. PARACHUTE CURRENT DROGUE MOVEMENT, NOVEMBER-DECEMBER

On this survey, three drogues were launched north of Point Arguello, off Point Sal. The two drogues at 50 feet moved in opposite directions. The 500-foot drogue, launched between the 50-foot drogues, moved northward, turning northeastward.

Southwest of Point Arguello, drogue patterns indicated a counterclockwise rotating eddy that was centered about 15 miles from shore. Flow from the southern edge of this eddy appeared to be eastward. As the drogues moved to the east, a southern component became apparent, similar to the pattern displayed by drogues released near the entrance to Santa Barbara Channel.

Farther south, along the line extending southwest from Point Arguello, the drogues showed a definite southwest flow pattern. Between this southwest flow and the southward flow near the entrance to Santa Barbara Channel, drogues displayed a northwestward component, indicating a probable eddy.

The drogues in Santa Barbara Channel described a mixed flow. The drogues along the north side of the channel indicated a strong westward current, whereas the drogues along the south side indicated an equally strong eastward current.

The effect of tidal currents on drogues is difficult to ascertain on both the January and November-December surveys because of the large time lapses between navigational fixes. Also, other factors, such as drag, prevailing winds, and localized eddies will influence drogue movement.

3. Geostrophic Currents. Surface dynamic topographies were contoured relative to the 200-meter (660 feet) and 500-meter (1640 feet) reference levels, and the topography at 200 meters was contoured relative to the 500-meter level. The 200-meter reference level was selected because it utilized a maximum amount of the data, and the 500-meter level was selected because it facilitated a comparison to the literature. In computing and analyzing the dynamic data, the major assumptions were that the reference level had no net motion, the flow was in a steady state, and the data were synoptic.

For the January survey, surface dynamic topographies indicate a counterclockwise rotating system southwest of Point Arguello (Fig. 12). North of this system, topographies show a northward movement, and to the south, a southeastward movement. The topography at 200 meters indicates flow to the north with the isobars paralleling the bottom contours (Fig. 13).

For the November-December survey, surface dynamic topographies indicate a southerly flow along the coast, turning eastward off Point Arguello (Fig. 14). The topography at 200 meters is poorly defined, but a northward flow, north of Point Arguello, and a south-easterly flow, south of the islands, are indicated (Fig. 15).

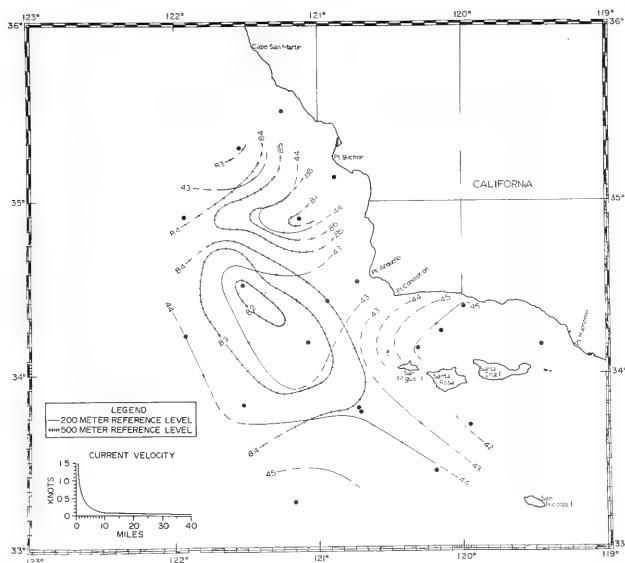


FIGURE 12 DYNAMIC TOPOGRAPHIES (0-DECIBAR SURFACE), JANUARY

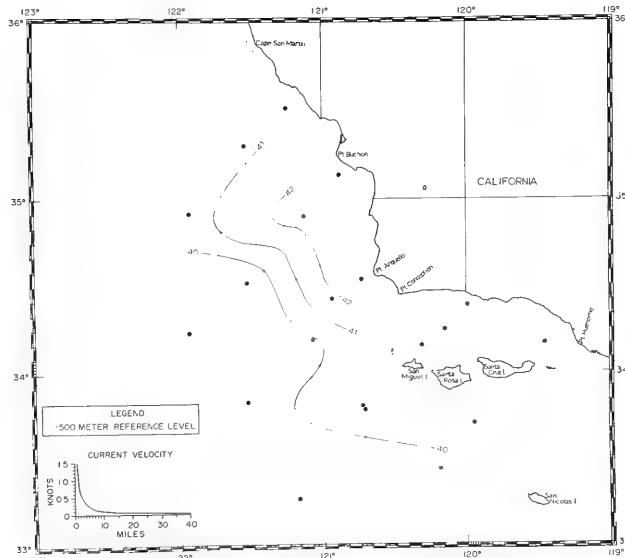


FIGURE 13 DYNAMIC TOPOGRAPHIES (200-DECIBAR SURFACE), JANUARY

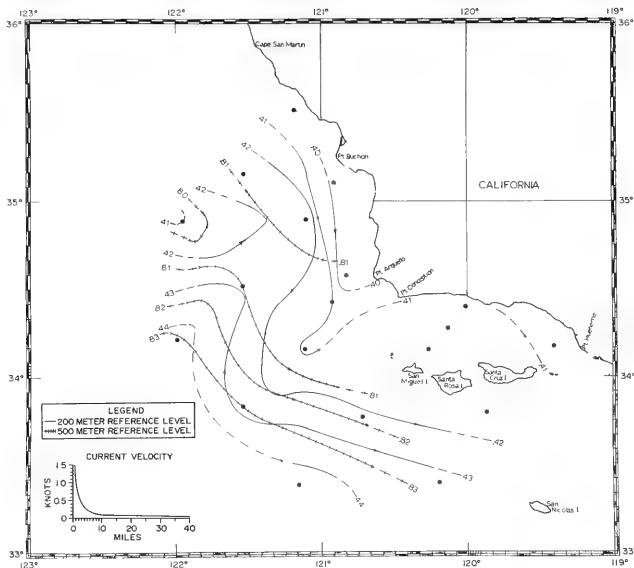


FIGURE 14 DYNAMIC TOPOGRAPHIES (0-DECIBAR SURFACE), NOVEMBER-DECEMBER

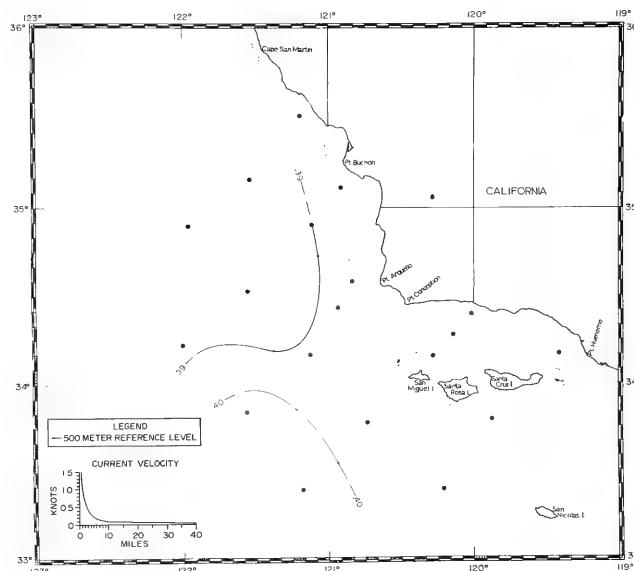


FIGURE 15 DYNAMIC TOPOGRAPHIES (200-DECIBAR SURFACE), NOVEMBER-DECEMBER

V. SUMMARY AND CONCLUSIONS

From analysis of these and other data, the flow pattern indicated in Figure 16 is believed to exist in early winter in the Point Arguello region.

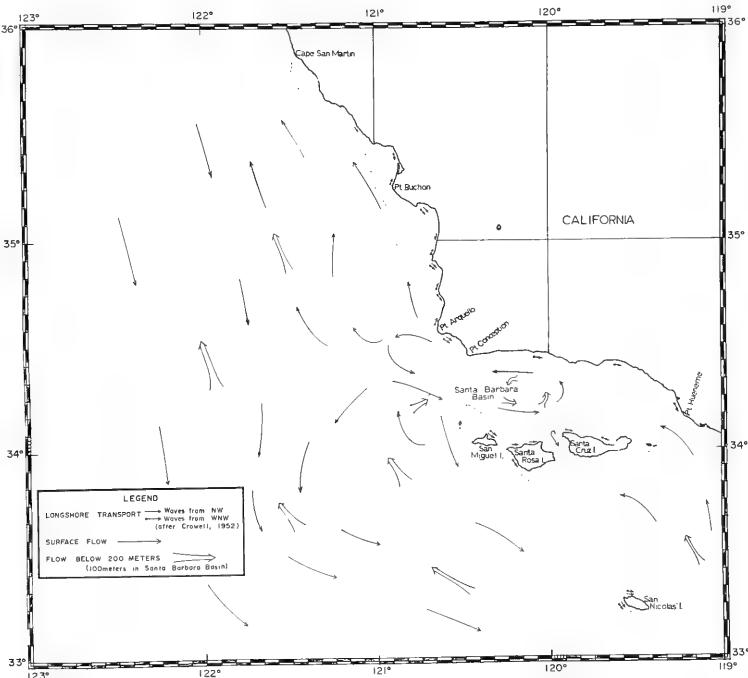


FIGURE 16. WINTER CIRCULATION

A strong westerly flow along the northern portion of Santa Barbara Channel exists in the surface layers. A corresponding easterly flowing current is developed in the southern portion of the channel. Although some water is discharged southward through Santa Cruz Channel, a larger inflow of surface waters enters between Point Hueneme and Santa Cruz Island.

North of Point Arguello, the northward flowing Davidson Current forms during November and December, and by January it is well developed. West of the Davidson Current, the California Current flows southward.

Southwest of Point Arguello, a complex series of eddys and meanders characterizes the surface flow. The major features of the area appear to be a counterclockwise rotating eddy just off Point Arguello and a seaward deflection of the California Current due to the influence of Rodriguez Dome.

The flow is northerly below 200 meters. A sluggish inflow into Santa Barbara Basin is indicated. Within the basin, flow is slow and erratic, apparently strongly influenced both by tidal and by seiche effects, but a general counterclockwise rotation is indicated.

Longshore currents transport sediments south and east along the coast (Crowell, 1952). Some sediment is discharged eastward down Arguello Canyon and its tributaries.

VI. ADDITIONAL WORK NEEDED IN THE AREA

Since the ocean area off Point Arguello offers a complex and changing environment, additional seasonal surveys, with close sampling grids, are needed for a thorough investigation of the currents. Time-series data to show tidal effects on water movement would provide corrections on parachute current drogues.

VII. REFERENCES

Crowell, J. C., 1952. Submarine Canyons Bordering Central and Southern California. J. Geology, vol. 60, no. 1, p. 58-83.

Emery, K. O., 1960. The Sea Off Southern California. John Wiley & Sons, New York, 365 pp.

Reid, J. L., G. I. Roden, and J. G. Wyllie, 1958. Studies of the California Current System. Prog. Rep. Calif. Coop. Ocean. Fish. Invest., 1 July 1956 to 1 January 1958, p. 27-56.

Scripps Institution of Oceanography, 1949-1963. Physical and Chemical Data From CCOFI Cruises... Mar. Life. Res. Proj., University of California.

_____, 1964. Environmental Studies in the Vicinity of Point Arguello. Institution of Marine Resources, University of California, Quarterly Progress Reports, April, July, and October 1964.

U.S. Coast and Geodetic Survey, 1964. Tide Tables, West Coast North and South America. U.S. Department of Commerce, Government Printing Office.

APPENDIX

2 Bottom Sediment Logs
2 Plankton Summary Sheets
47 Current Drogue Summary Sheets

BOTTOM SEDIMENT LOG (JANUARY)

BOTTOM SEDIMENT LOG (NOVEMBER-DECEMBER)

VESSEL	USS INDEPENDENCE (ADS 50)	CRUISE	32216	CHECKED BY		DATE CHECKED						
				TESTING STATION NO.	SAMPLE POSITION (TEST) NO.	DEPTH (feet)	GEOPHOTOGRAPH OF IMMEDIATE AREA	TYPE OF SEDIMENT	TESTS PERFORMED IN SITU	TESTS PERFORMED IN LABORATORY	FIELD DESCRIPTION OF CORE AND REACTIONS	
1	11/26	32°22' 121°08'	1920	San Miguel Basin	Kiborg w/field arm	250	1.6	fine-grained silt			Assigned station #1	10/10
2	11/27	32°31' 120°16'	60	San Miguel Basin	"	21	15°	gray-green silt 200lb pullout			Assigned station #2	10/10
3	11/27	32°23' 120°55'	148	San Miguel Basin	"	—	31	500 lb pullout			Assigned station #3	10/10
4	11/28	35°08' 122°30'	310	Off Point Arguello	"	31	11	coarse black sand			Assigned station #4	10/10
5	11/28	35°31' 121°31'	139	Off Point Arguello	Kiborg w/ field arm	51	21°	coarse sand grading to gravel			Assigned station #5	10/10
6	11/28	35°06' 120°53'	80	San Jose Channel Bay	Kiborg w/field arm	200	6	35°			Assigned station #6	10/10
7	11/28	34°53' 121°06'	296	San Jose Channel Bay	"	16	32°	olive silt 900 lb pullout			Assigned station #7	10/10
8	11/29	34°08' 120°15'	202	Off Point Arguello	"	6	6°	olive sandy gravel			Assigned station #8	10/10
9	11/29	34°16' 120°07'	290	Santa Barbara Channel	"	41	32°	sandy silty-olive			Assigned station #9	10/10
10	11/29	34°23' 120°00'	42	Santa Barbara Channel	"	67	5°	sandy silty-olive			Assigned station #10	10/10

PLANKTON SUMMARY (JANUARY)

Species Number	1	2	3	4	5	6	7	8	9	10	11
Date	1/21	1/21	1/21	1/21	1/21	1/22	1/23	1/23	1/23	1/26	1/28
Time (GHT)	2030	1930	2255	0001	0400	0945	0300	1100	0500	0430	0800
Duration of tow	10 min	1 hr.	1 hr.	1 hr.	1 hr.	1 hr.	1 hr.	1 hr.	1 hr.	1 hr.	1 hr.
Type of tow	Vert.	Hor.	Hor.	Hor.	Hor.	Hor.	Hor.	Hor.	Hor.	Hor.	Hor.
Depth of tow	TOC100	Surf.	Surf.	200M.	Surf.						
Ocean Station Number	#1	#1	#2	#3	#4	#7	#9	#12	#18	#17	
Wet Volume (in less than)	1.0 cc	6.0 cc	1.0cc	3.1cc	6.0cc	0.6cc	1.0cc	0.1cc	10cc	0.3cc	0.1cc
CHrysophyta											
Diatom											
Cocconeisoides sp.											
10											
PROTISTOA											
Stramenopila											
Radiolaria	1		20	20		3	4			13	
Myctophorae											
Dinoflagellata:											
Ceratium sp.										3	6
COELIANTHIDA											
Synthetica			2	15	150	43	2	5		10	1
Hydrozoa											
Siphonophora	15	12		45	50	8	3			4	
Soleniella sp.					30	1					
Physciedid						130					
CTENOPHORA (unidentified)							20	2		1	
HYDROZOA											
(Cynophantes)								1	1	1	
ANELIDA											
Polychaeta (larvae)								1	2		1
ARTHROPODA											
Crustacea											
Copepoda:											
Calanus sp.	175	30	8	715	110	48	60	1	15	35	5
Rhincalanus nasutus	5				120	1	2	1	2	35	1
Rhincalanus cornutus	125	2		210	60	10	7		2	30	1
Corycaeus sp.	5			10		1	5	1			
Phronimidae	135			50	270	36	2	1	1	21	
Malacostrid sp.				20							
Oithona sp.	40	5		15	20	10	10	1		3	1
Acartia sp.	10	11	5	310	40	3					
Metridiidae sp.	10			30							
Tenagomys sp.	15	20									
Candacia sp.	15	1		10	30	6	10		2	26	3
Metridia sp.					10	11					
Oncaea sp.								1			
Amphipoda (larvae)											
Sapphirhita sp.	5			5							
Lucicutia sp.	6			1		10					
Fontellididae sp.	6	3		20							
Gennadas sp.											
Lucicutia elongata											
Labidocera triplosa	5										
Calocalanus eave											
Microcalanus sp.											
Calanus sp.											
Calanus gracilis											
Eucalanus pulchra	5									2	
Calanus robustus										2	2
Comopoda (larvae) (unidentified)	3			2		1	2	2			
Comopoda (unidentified)											
Ostracoda:											
Conchoecia sp.	10			45	10	1	1			3	
Cladocera:											
Bythotrephes sp.				8	60	4					
Amphipoda:											
Brachycyellus sp.							10				
Vibilia sp.	3										
Paracalanus sp.							3				
Excius sp.							20				
Amphipoda (unidentified)	5						40				
Euphausiaceae:											
Unidentified species	225	84	1	225	520	35	65	1	22		
Unidentified larvae											
Unidentified larvae	5	6	7	5	10	2	1				
Sergestid larvae	10	1			10	4	1				
Cirripedia:											
Palanus sp. (cyparis)	1	3			20						
Palanus sp. (nauplius)					10	30	2				
MOLLUSCA											
Pteropoda:											
Lamachina sp.	5	1		5	190	6	2	1		36	2
Calanus sp.		1			20	2	8	1			7
Heteropoda:											
Atlanta sp.	2	4	1		40	6	4	1	25		
Ceratopoma					1						
CHILOPODA											
2h2	121	11	300	460	52	26	2	1	12	2	
ECHINODERMATA											
Auricularia larvae					15	30	3	1		3	
Schizopluteus larvae					20	5	4	12	1		
Ophiurid larvae							6				
INVERTEBRATE eggs	25		14						26	2	2
VERTEBRATA											
Lampris											
Synoplecta sp.	30	35		75	820	41	8	1	31	1	
Thalassica sp.				2	5	20	2	14			
Sabicea sp.	6	26	10	15	1	27	90	4	5	10	68
Argyropelecus mordax		10									
Scorpaenichthys marmoratus		1									
Citharichthys stigmatus											
Cottidae (unidentified)		2									
Fish eggs				19	165	20		1	19	8	

PLANKTON SUMMARY (NOVEMBER-DECEMBER)				
Sample Number	PL#1	PL#2	PL#3	PL#4
Date	11/26	11/26	11/28	11/28
Time (GMT)	2000	0053	0015	0010
Duration of tow	1 hr.	1 hr.	1 hr.	1 hr.
Depth of sample	Surf.	Surf.	Surf.	Surf.
Type of tow	Horz.	Horz.	Horz.	Horz.
Ocean Station Number	18	12	9	13
Wet Volume	29 cc	40 cc	77 cc	35 cc
COELENTERATA				
Scyphozoa	45	125(lar)	90	15
Nematoceti				
Siphonophora	5		14	5
Ctenophora	1	175	2	1
BRACHYPODA				
Cyphonautes	1		2	10
ANELLINE				
Polychaeta	10		2	1
ARTHROPODA				
Crustacea				
Copepoda:				
<i>Euchaeta</i> sp.		25	2	
<i>Leptodiaptius</i> sp.	5			
<i>Metridia</i> sp.	5			
<i>Rhincalanus</i> <i>nastus</i>	5	175	62	
<i>Rhincalanus</i> <i>cornutus</i>		175	14	
<i>Sapphirina</i> sp.	10		58	
<i>Eucalanus</i> <i>elongatus</i>	10			1
<i>Orcaea</i> sp.	10	1375	2250	1080
<i>Pontellopsis</i> sp.		25	16	50
<i>Candacia</i> <i>aethiopica</i>		25	52	5
<i>Usetamia</i> sp.	5			
<i>Corycaeus</i> sp.				
<i>Fleurobranchus</i> sp.	1205	3700	918	
Copepoda (unidentified)	350	25		
Amphipoda:				
<i>Priono macropa</i>				1
<i>Vivipara</i> sp.			2	
<i>Pseudosphaeroma</i> <i>platyceratum</i>		7		
<i>Paraphronima</i> <i>crassipes</i>	7			
<i>Paraphronima</i> <i>gracilis</i>				7
<i>Hymania</i> <i>schizogenes</i>	7			
<i>Archivomeria</i> <i>blossvillae</i>		7		
<i>Hyperoche</i> <i>mediterraneum</i>		7		
Euphausiaceae				
<i>Euphausia pacifica</i>	1145	2325	1830	200
Isopoda:		20		
Ostracoda:				
<i>Conchoecia</i> sp.			1	
Decapoda:				
(Squatpid larvae)				
(Mesoplopidae larvae)	5			
(Unidentified larvae)	5	125		
(Identified larvae)	10	50	12	20
Cladocera:				
<i>Eurydice</i> sp.			52	
Stomatopoda: (larvae)			25	
Cirripedia:				
<i>Balanus</i> sp. (cypris stage)				
<i>Balanus</i> sp. (nauplius)			12	5
Arachnida: (mites)	1			6
MOLLUSCA				
Pteropoda:				
<i>Clione</i> sp.	15		8	
<i>Scaphopis</i> sp.	1	25	12	
<i>Leptopis</i> sp.	45	150	1	
Heteropoda:				
<i>Atlanta</i> sp.	1			
Octopoda:	1		1	
TUNICATA				
Larvacea				
<i>Oikopleura</i> sp.	30	2725	385	235
Thaliacea				
<i>Salpa</i> sp.	5		85	40
<i>Dolichon</i> sp.	100	75	275	225
<i>Pyrosoma</i> sp.				1
Invertebrate egg		50	8	
VERTEBRATA				
Pisces (egg)	15			
Pisces (larvae) Syngnathidae, et.al.	2	6		1

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 1 Depth 50 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0718/25	34 05.0°	119 59.7°	Radar	3.0	0.3	0.1
1021	34 05.2°	119 59.5°	Radar	3.1	1.2	0.4
1329	34 06.3°	119 59.6°	Radar	3.5	1.0	0.3
1800	34 06.5°	120 00.9°	Radar	2.6	1.2	0.5
1936	34 05.4°	120 01.2°	Radar	9.6	1.3	0.1
0511/26	34 04.9°	119 59.7°	Radar	18.8	1.0	0.1
0958	34 03.4°	119 59.5°	Radar			

DROGUE NO. 2 Depth 1000 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0549/25	34 14.9°	119 58.5°	Radar	3.3	0.3	0.1
0909	34 14.4°	119 58.2°	Radar	3.1	0.8	0.3
1216	34 13.8°	119 58.9°	Radar	2.4	0.5	0.2
1440	34 13.5°	119 58.7°	Radar	3.2	1.1	0.3
1752	34 13.3°	119 59.8°	Radar	8.9	1.3	0.1
0247/26	34 12.8°	119 58.4°	Radar	20.2	1.9	0.1
2302	34 11.0°	119 57.3°	Radar			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 3 Depth 300 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0515/25	34° 13.8'	119° 53.0'	Radar	3.2	1.2	0.4
0830	34° 12.8'	119° 53.6'	Radar	3.2	1.0	0.3
1144	34° 11.7'	119° 54.2'	Radar	4.1	1.2	0.3
1550	34° 10.8'	119° 53.3'	Radar	2.9	0.8	0.3
1847	34° 10.9'	119° 52.1'	Radar	9.1	2.3	0.3
0354/26	34° 11.8'	119° 49.5'	Radar	15.9	7.7	0.5
1949	34° 18.2'	119° 54.3'	Radar			

DROGUE NO. 4 Depth 50 ft. Month January Year 1964

Time/Day	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0507/25	34° 13.8'	119° 52.2'	Radar	3.4	1.6	0.5
0829	34° 12.2'	119° 52.9'	Radar	3.0	1.0	0.3
1127	34° 11.2'	119° 52.1'	Radar	4.0	1.0	0.2
1530	34° 12.0'	119° 51.2'	Radar	3.1	0.3	0.1
1836	34° 12.4'	119° 51.6'	Radar	9.5	3.2	0.3
0405/26	34° 14.2'	119° 48.4'	Radar	14.9	8.8	0.6
1902	34° 16.2'	119° 58.6'	Radar			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 5 Depth 50 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0630/25	34 09.6°	119 56.5°	Radar	3.4	0.9	0.3
0952	34 08.6°	119 56.5°	Radar	3.2	0.4	0.1
1302	34 08.4°	119 56.0°	Radar	3.1	1.2	0.4
1610	34 08.5°	119 54.4°	Radar	2.8	1.7	0.6
1900	34 08.2°	119 52.4°	Radar	8.6	3.1	0.4
0335/26	34 08.5°	119 48.5°	Radar	18.4	7.9	0.4
2200	34 16.3°	119 48.5°	Radar			

DROGUE NO. 6 Depth 50 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
2132/25	34 08.9°	120 29.4°	Radar	10.8	1.3	0.1
0821/26	34 07.9°	120 28.2°	Radar	4.3	0.5	0.1
1240	34 07.6°	120 28.8°	Radar			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 7 Depth 50 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
	°	°		(hr)	(nm)	(kts)
2217/25	34 13.4°	120 25.3°	Radar	10.7	3.0	0.3
0858/26	34 14.5°	120 28.5°		4.7	1.9	0.4
1339	34 16.0°	120 30.4°		13.6	3.2	0.2
2719	34 17.3°	120 33.9°				

DROGUE NO. 8 Depth 1000 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
	°	°		(hr)	(nm)	(kts)
2242/25	34 15.9°	120 23.2°	Radar	10.8	0.3	0
0933/26	34 16.0°	120 23.5°		4.8	0.5	0.1
1143	34 16.2°	120 23.5°		13.8	0.4	0
0412/27	34 16.6°	120 23.6°				

DROGUE NO. 9 Depth 50 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
	°	°		(hr)	(nm)	(kts)
2310/25	34 19.0°	120 20.5°	Radar	10.8	1.3	0.1
1001/26	34 17.7°	120 19.6°		4.8	0.6	0.1
1141/28	34 17.7°	120 20.5°		13.9	1.3	0.1
0442/27	34 17.1°	120 19.0°				

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 10 Depth 300 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
	°	°			(hr)	(nm)
2331/25	34 21.6°	120 17.9°	Radar	11.0	1.3	0.1
1029/26	34 20.9°	120 16.6°	Radar	5.1	1.8	0.4
1533	34 20.0°	120 15.0°	Radar	13.5	2.6	0.2
0505/27	34 17.1°	120 16.2°	Radar			

DROGUE NO. 11 Depth 50 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
	°	°			(hr)	(nm)
2339/25	34 22.4°	120 17.5°	Radar	10.9	1.2	0.1
1032/26	34 21.5°	120 16.5°	Radar	4.7	1.1	0.2
1516	34 21.0°	120 17.6°	Radar	15.6	1.3	0.1
0652/27	34 20.4°	120 16.0°	Radar			

DROGUE NO. 12 Depth 50 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
	°	°			(hr)	(nm)
0001/26	34 24.6°	120 15.5°	Radar	11.0	1.4	0.1
1100	34 23.8°	120 14.2°	Radar	5.1	1.0	0.2
1608	34 23.8°	120 15.5°	Radar	13.7	2.8	0.2
0547/27	34 23.0°	120 12.4°	Radar			

CURRENT DRGUE SUMMARY SHEET

DROGUE NO. 13 Depth 50 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
	°	°			(hr)	(nm)
1719/28	34 32.7°	120 41.9°	Radar	6.2	1.2	0.2
2329	34 33.9°	120 42.0°	Radar	20.3	4.2	0.2
1945/29	34 31.6°	120 46.1°	Radar			

DROGUE NO. 14 Depth 300 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
	°	°			(hr)	(nm)
1648/28	34 30.2°	120 45.1°	Radar	1.1	0.2	0.2
1755	34 30.0°	120 45.5°	Radar	5.0	0.7	0.1
2256	34 30.6°	120 45.1°	Radar	1.1	0.3	0.3
0003/29	34 30.6°	120 45.5°	Radar	19.4	0.7	0
1926	34 30.2°	120 44.9°	Radar			

DROGUE NO. 15 Depth 50 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
	°	°			(hr)	(nm)
1639/28	34 29.8°	120 45.8°	Radar	1.4	1.0	0.7
1803	34 30.5°	120 46.4°	Radar	4.6	1.8	0.4
2238	34 28.5°	120 46.8°	Radar	1.9	1.1	0.6
0035/29	34 27.6°	120 47.0°	Radar	17.2	7.0	0.4
1750	34 23.7°	120 53.8°	Radar			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 16 Depth 50 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
1608/28	34 27.5°	120 49.0°	Radar	2.4	1.2	0.5
1830	34 27.0°	120 50.1°	Radar	3.0	0.2	0.1
2129	34 26.7°	120 50.3°	Radar	3.6	0.3	0.1
0105/29	34 26.2°	120 50.5°	Radar	14.1	6.0	0.4
1510	34 24.4°	120 57.6°	Radar	2.1	1.9	0.9
1714	34 25.5°	120 59.4°	Radar			

DROGUE NO. 17 Depth 1000 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
1557/28	34 26.6°	120 49.6°	Radar	2.9	0.8	0.3
1853	34 26.0°	120 49.1°	Radar	3.2	1.5	0.5
2207	34 25.0°	120 48.1°	Radar	3.3	1.1	0.3
0125/29	34 24.0°	120 48.7°	Radar	17.1	9.7	0.6
1829	34 22.1°	120 37.5°	Radar			
Note: This drogue appears to have lost its parachute very early. Thus all data are probably for a float without its parachute. Winds on the 28th were from 320°-360° and 10-20 kts.						

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 18 Depth 300 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
1510/28	34 24.8°	120 53.0°	Radar	4.4	1.9	0.4
1935	34 25.0°	120 55.5°	Radar	1.3	0.7	0.5
2055	34 25.6°	120 55.9°	Radar	18.7	0.5	0
1535/29	34 25.9°	120 56.2°	Radar	0.8	1.4	1.8
1625	34 27.0°	120 57.4°	Radar			

DROGUE NO. 19 Depth 50 ft. Month January Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
1422/28	34 21.5	120 58.0°	Radar	5.9	4.5	0.8
2014	34 25.3°	121 00.7°	Radar			

CURRENT DRUGUE SUMMARY SHEET

DROGUE NO. 1 Depth 50 ft. Month November Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
2210/28	34 23.6°	120 00.2°	Lorac	5.9	2.5	0.4
0404/29	34 25.2°	120 02.7°	Lorac	7.0	2.0	0.3
1106	34 26.3°	120 04.8°	Lorac	4.8	1.7	0.4
1552	34 25.9°	120 06.7°	Lorac	4.7	2.4	0.5
2032	34 26.8°	120 09.3°	Radar	8.5	2.9	0.3
0500/30	34 26.3°	120 13.0°	Lorac	4.2	2.3	0.5
0913	34 27.2°	120 15.4°	Radar	4.9	3.2	0.7
1408	34 26.0°	120 19.0°	Radar			

DROGUE NO. 2 Depth 50 ft. Month November Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
2356/28	34 18.7°	120 06.3°	Lorac	3.4	1.8	0.5
0321/29	34 20.2°	120 07.9°	Lorac	1.5	1.0	0.7
0454	34 21.0°	120 08.3°	Lorac	6.7	2.1	0.3
1134	34 22.4°	120 10.2°	Lorac	4.7	0.8	0.2
1618	34 21.9°	120 10.8°	Lorac	4.4	3.8	0.9
2040	34 22.5°	120 15.4°	Lorac	4.5	2.6	0.6
0110/30	34 23.3°	120 18.5°	Lorac	4.0	1.4	0.4
0513	34 23.0°	120 20.2°	Lorac	4.0	3.6	0.9
0913	34 23.1°	120 24.3°	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 3 Depth 500 ft. Month November Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0100/29	34 13.8°	120 12.5°	Lorac	1.5	0.1	0.1
0229	34 13.8°	120 12.3°	Lorac	3.4	0.3	0.1
0554	34 13.9°	120 12.0°	Lorac	6.5	0.4	0.1
1224	34 14.3°	120 12.2°	Lorac	4.5	1.2	0.3
1654	34 14.2°	120 10.9°	Lorac	4.6	0.5	0.1
2128	34 13.7°	120 11.0°	Lorac	4.6	0.1	0
0206/30	34 13.7°	120 11.2°	Lorac	4.1	0.7	0.2
0611	34 14.3°	120 10.8°	Lorac	4.2	0.2	0
1021	34 14.4°	120 10.9°	Lorac	8.4	1.2	0.1
1844	34 14.7°	120 09.6°	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 4 Depth 50 ft. Month Nov.-Dec. Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0114/29	34 09.7°	120 16.7°	Lorac	4.8	1.7	0.4
0628	34 10.0°	120 14.6°	Lorac	6.1	2.3	0.4
1234	34 10.3°	120 11.9°	Lorac	4.6	1.8	0.4
1711	34 10.6°	120 09.7°	Lorac	4.6	0.4	0.1
2146	34 10.3°	120 09.2°	Lorac	4.6	1.3	0.3
0220/30	34 11.4°	120 08.6°	Lorac	4.1	1.8	0.4
0629	34 12.2°	120 06.7°	Lorac	4.2	0.2	0
1040	34 12.1°	120 06.4°	Lorac	8.3	1.2	0.1
1901	34 13.3°	120 05.9°	Lorac	6.2	0.4	0.1
0111/1	34 13.0°	120 05.5°	Lorac			

DROGUE NO. 5 Depth 50 ft. Month November Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0802/29	34 05.9°	119 59.8°	Lorac	5.5	1.7	0.3
1335	34 05.9°	119 57.7°	Lorac	4.5	1.2	0.3
1806	34 06.2°	119 56.3°	Radar	4.4	1.2	0.3
2228	34 06.4°	119 54.8°	Lorac	4.7	1.0	0.2
0308/30	34 06.7°	119 53.7°	Radar	3.9	0.9	0.2
0700	34 06.9°	119 52.8°	Radar	4.8	2.2	0.5
1148	34 07.3°	119 50.0°	Lorac	8.7	4.8	0.6
2028	34 07.6°	119 44.3°	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 6 Depth 50 ft. Month Nov.-Dec. Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
				(hr)	(nm)	(kts)
0844/29	0° 34' 11.1"	0° 120 00.1"	Lorac	5.3	0.9	0.2
1402	0° 34 10.6"	0° 119 59.2"	Radar	4.4	0.3	0.1
1826	0° 34 10.4"	0° 119 59.4"	Lorac	4.4	0.9	0.2
2252	0° 34 10.8"	0° 120 00.3"	Lorac	4.0	0.7	0.2
0254/30	0° 34 10.7"	0° 119 59.5"	Lorac	4.1	0.5	0.1
0700	0° 34 10.8"	0° 119 58.9"	Lorac	4.2	0.3	0.1
1110	0° 34 10.5"	0° 119 58.9"	Lorac	8.4	1.4	0.2
1936	0° 34 10.7"	0° 119 57.2"	Lorac	6.6	1.6	0.2
0211/1	0° 34 10.0"	0° 119 55.7"	Lorac	9.7	3.1	0.3
1156	0° 34 08.2"	0° 119 52.4"	Lorac			

DROGUE NO. 7 Depth 300 ft. Month November Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
				(hr)	(nm)	(kts)
0928/29	0° 34 15.1"	0° 119 55.6"	Lorac	5.0	2.1	0.4
1428	0° 34 16.0"	0° 119 57.7"	Lorac	4.5	1.3	0.3
1859	0° 34 17.1"	0° 119 58.8"	Lorac	4.4	1.4	0.3
2324	0° 34 17.3"	0° 120 00.5"	Radar	0.6	0.2	0.3
2358	0° 34 17.3"	0° 120 00.7"	Lorac	4.1	1.4	0.3
0404/30	0° 34 17.9"	0° 120 02.1"	Lorac	3.6	1.4	0.4
0743	0° 34 18.8"	0° 120 03.4"	Radar	5.6	2.6	0.5
1320	0° 34 21.1"	0° 120 05.3"	Lorac	10.5	6.7	0.6
2350	0° 34 26.2"	0° 120 10.2"	Radar			

DROGUE NO. 8 Depth 50 ft. Month November Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0958/29	34 18.0°	119 51.6°	Lorac	4.8	1.6	0.3
1448	34 18.1°	119 53.5°	Lorac	4.4	1.5	0.3
1915	34 18.2°	119 55.3°	Lorac	4.1	1.8	0.4
2324	34 18.0°	119 57.7°	Radar	0.3	0.2	0.7
2343	34 17.9°	119 57.8°	Lorac	4.3	1.7	0.4
0404/30	34 18.7°	119 59.6°	Radar	3.6	1.2	0.3
0743	34 19.5°	120 00.7°	Lorac	5.4	1.6	0.3
1306	34 19.4°	120 02.6°	Lorac	10.4	4.1	0.4
2333	34 20.9°	120 07.2°	Lorac			

DROGUE NO. 9 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
1630/1	34 15.1°	120 35.0°	Lorac	0.8	0.7	0.9
1720	34 14.7°	120 34.5°	Radar	5.6	2.9	0.5
2254	34 11.8°	120 34.2°	Lorac	4.3	1.4	0.3
0310/2	34 10.4°	120 34.9°	Lorac	6.3	1.2	0.2
0928	34 09.3°	120 34.6°	Lorac	4.6	1.3	0.3
1407	34 07.9°	120 34.2°	Lorac	2.7	1.6	0.6
1644	34 07.3°	120 32.6°	Radar	3.4	1.8	0.5
2008	34 05.5°	120 32.2°	Radar	2.8	1.4	0.5
2255	34 04.3°	120 33.1°	Radar	5.2	0.7	0.1
0410/3	34 04.2°	120 33.8°	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 10 Depth 50 ft. Month December Year 1964

DROGUE NO. 11 Depth 500 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
1756/1	34 07.4°	120 43.4°	Lorac	2.7	0.2	0.1
2038	34 07.6°	120 43.2°	Lorac	5.5	0.8	0.1
0206/2	34 08.1°	120 42.8°	Lorac	1.1	0.1	0.1
0310	34 08.2°	120 42.7°	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 12 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
1756/1	34 07.4 ¹	120 43.4 ¹	Lorac	2.5	0.9	0.4
	34 06.7 ¹	120 44.2 ¹		0.5	0.3	0.6
2100	34 06.7 ¹	120 44.6 ¹	Radar	2.5	1.2	0.5
	34 05.5 ¹	120 44.2 ¹		1.1	0.8	0.7
0034/2	34 05.3 ¹	120 45.2 ¹	Lorac	1.9	1.5	0.8
	34 04.5 ¹	120 46.7 ¹		1.6	1.0	0.6
0404	34 04.5 ¹	120 47.8 ¹	Lorac	7.6	3.5	0.5
	34 07.3 ¹	120 50.4 ¹		1.0	0.1	0.1
1238	34 07.2 ¹	120 50.3 ¹	Lorac	6.5	2.3	0.4
	34 09.2 ¹	120 51.8 ¹		3.4	0.9	0.3
2230	34 09.8 ¹	120 51.2 ¹	Lorac	4.1	0.6	0.1
	34 09.1 ¹	120 51.1 ¹		4.2	1.4	0.3
0648	34 09.3 ¹	120 52.7 ¹	Lorac	5.6	0.8	0.1
	34 10.2 ¹	120 53.1 ¹		0.9	0.1	0.1
1318	34 10.0 ¹	120 53.2 ¹	Lorac	1.0	0.1	0.1
	34 09.8 ¹	120 53.2 ¹		0.8	0.4	0.5
1509	34 09.7 ¹	120 53.7 ¹	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 13 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
1911/1	34 00.7°	120 51.0°	Lorac	6.3	0.8	0.1
0130/2	34 00.7°	120 51.9°	Lorac	2.7	1.3	0.5
0140	34 01.0°	120 53.3°	Radar	0.6	0.4	0.7
0146	34 01.3°	120 53.6°	Lorac	6.3	2.2	0.3
1104	34 03.5°	120 53.2°	Lorac	7.4	2.1	0.3
1826	34 04.7°	120 55.3°	Lorac	3.4	1.5	0.4
2152	34 06.1°	120 54.7°	Lorac	4.2	1.2	0.3
0205/3	34 07.0°	120 55.7°	Lorac	4.3	1.3	0.3
0621	34 08.2°	120 56.2°	Lorac	6.5	1.9	0.3
1252	34 10.2°	120 57.0°	Lorac	1.0	0.2	0.2
1351	34 10.1°	120 57.1°	Lorac	0.9	0.1	0.1
1445	34 10.0°	120 57.0°	Lorac	0.8	0.3	0.4
1536	34 10.0°	120 56.7°	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 14 Depth 50 ft. Month December Year 1964

Time/Day	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
				(hr)	(nm)	(kts)
1838/1	34 03.7°	120 47.8°	Lorac	1.3	0.4	0.3
1955	34 04.2°	120 47.9°	Lorac	4.6	1.1	0.2
0030/2	34 03.9°	120 49.1°	Radar	0.5	0.2	0.4
0102	34 03.8°	120 49.3°	Lorac	1.1	0.7	0.6
0206	34 03.4°	120 49.8°	Lorac	2.6	2.8	1.1
0440	34 01.7°	120 52.4°	Lorac			

DROGUE NO. 15 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time	Dist.	Ave.Vel.
				(hr)	(nm)	(kts)
1843/3	34 02.3°	121 16.9°	Lorac	6.0	6.6	1.1
0046/4	33 56.9°	121 21.5°	Lorac	6.3	4.7	0.7
0705	33 52.7°	121 24.0°	Lorac	7.7	7.2	0.9
1150	33 45.5°	121 25.2°	Lorac	6.6	1.7	0.3
2126	33 44.9°	121 24.8°	Radar	7.6	5.4	0.7
0500/5	33 39.4°	121 24.6°	Radar	7.6	1.5	0.2
1238	33 37.0°	121 24.1°	Lorac	7.2	0.7	0.1
1948	33 36.7°	121 24.8°	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 16 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
1936/3	34 06.1°	121 12.1°	Lorac	0.8	1.2	1.5
2027	34 05.2°	121 13.2°		0.2	0.2	1.0
2042	34 05.1°	121 13.4°	Radar	2.7	2.7	1.0
2322	34 02.8°	121 15.2°		0.7	0.6	0.9
0002/4	34 02.6°	121 15.7°	Lorac	1.5	1.3	0.9
0134	34 01.7°	121 16.7°		4.8	3.6	0.8
0622	33 59.5°	121 20.2°	Lorac	1.5	1.0	0.7
0753	33 59.1°	121 21.3°		5.9	2.9	0.5
1347	33 56.9°	121 23.6°	Lorac	7.3	5.7	0.8
2105	33 51.7°	121 26.6°		6.6	3.8	0.6
0342/5	33 49.2°	121 29.9°	Lorac	7.6	3.5	0.5
1117	33 47.7°	121 33.7°		10.5	5.7	0.5
2150	33 44.0°	121 39.0°	Radar			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 17 Depth 500 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
2024/3	34 09.9°	121 07.8°	Lorac	2.8	2.2	0.8
2312	34 07.7°	121 07.8°	Lorac	3.6	0.2	0.1
0246/4	34 07.8°	121 07.9°	Lorac	2.2	0.5	0.2
0456	34 07.6°	121 08.3°	Lorac	4.8	1.1	0.2
0944	34 06.6°	121 08.7°	Lorac	1.9	0.4	0.2
1138	34 06.2°	121 08.6°	Lorac	6.2	2.0	0.3
1750	34 04.2°	121 08.1°	Lorac	1.3	0.8	0.6
1906	34 03.5°	121 08.3°	Lorac	4.9	1.6	0.3
2358	34 02.0°	121 08.7°	Lorac	1.5	0.7	0.5
0129/5	34 01.5°	121 09.3°	Lorac	5.8	0.5	0.1
0716	34 01.1°	121 09.5°	Lorac	1.4	0.2	0.1
0838	34 00.9°	121 09.4°	Lorac	6.8	2.4	0.4
1521	33 58.4°	121 09.6°	Lorac	1.9	0.8	0.4
1713	33 57.7°	121 10.0°	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 18 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
2022/3	34 10.0°	121 07.7°	Lorac	2.7	1.25	0.5
2304	34 08.9°	121 07.0°		3.4	3.8	1.1
0227/4	34 05.6°	121 09.3°	Lorac	2.9	2.2	0.8
0524	34 03.7°	121 10.7°				

DROGUE NO. 19 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
2105/3	34 13.0°	121 03.4°	Lorac	1.5	1.1	0.7
2236	34 12.0°	121 03.7°		4.6	2.7	0.6
0310/4	34 09.3°	121 03.9°	Lorac	1.4	0.9	0.6
0434	34 08.5°	121 04.5°		4.9	3.1	0.6
0929	34 05.8°	121 06.6°	Lorac	2.4	2.2	0.9
1154	34 03.8°	121 07.5°		5.3	5.3	1.0
1713	33 58.8°	121 09.8°	Lorac	2.4	1.5	0.6
1940	33 57.4°	121 09.9°		3.6	1.9	0.5
2315	33 55.6°	121 10.6°	Lorac	2.9	1.9	0.7
0212/5	33 53.8°	121 11.5°		4.1	2.2	0.5
0616	33 51.7°	121 12.6°	Lorac	3.5	1.9	0.5
0946	33 50.1°	121 13.6°		4.3	2.8	0.6
1403	33 47.7°	121 15.3°	Lorac	5.7	2.1	0.4
1946	33 45.5°	121 15.2°				

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 20 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
2149/3	34 17.1°	120 59.6°	Lorac	6.1	2.7	0.4
0353/4	34 14.7°	121 01.0°	Lorac	6.8	2.2	0.3
1041	34 13.7°	121 03.5°	Lorac	7.8	4.9	0.6
1827	34 08.9°	121 05.2°	Lorac	6.2	1.7	0.3
0042/5	34 07.6°	121 04.9°	Lorac	7.2	1.6	0.2
0756	34 06.1°	121 04.6°	Lorac	8.5	0.9	0.1
1627	34 05.3°	121 04.3°	Lorac			

DROGUE NO. 21 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0219/6	34 20.8°	120 55.5°	Radar	7.7	4.7	0.6
1000	34 17.4°	120 51.6°	Radar	3.1	2.2	0.7
1306	34 16.7°	120 49.1°	Lorac	4.0	1.8	0.5
1706	34 15.7°	120 47.2°	Lorac	4.8	1.9	0.4
2152	34 16.2°	120 45.0°	Lorac	5.2	1.8	0.4
0303/7	34 16.3°	120 42.8°	Lorac	5.7	1.7	0.3
0843	34 15.4°	120 41.1°	Lorac	5.5	0.8	0.1
1416	34 15.3°	120 41.2°	Lorac	5.8	2.3	0.4
2005	34 13.7°	120 38.1°	Lorac	5.8	2.1	0.4
0152/8	34 12.6°	120 36.1°	Lorac	7.5	2.6	0.3
0922	34 11.3°	120 33.3°	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 22 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0258/6	34 24.7°	120 50.8°	Radar	6.5	0.4	0.1
0927	34 24.5°	120 51.2°	Radar	4.4	1.4	0.3
1351	34 25.7°	120 50.3°	Lorac	2.1	0.5	0.2
1555	34 25.8°	120 49.6°	Lorac	2.6	0.2	0.1
1830	34 25.8°	120 49.4°	Lorac	2.1	0.3	0.1
2037	34 25.7°	120 49.7°	Lorac	2.7	0.8	0.3
2322	34 26.5°	120 50.0°	Lorac	2.1	0.9	0.4
0131/7	34 27.4°	120 50.2°	Lorac	3.3	1.1	0.3
0450	34 28.3°	120 50.8°	Lorac	2.0	0.2	0.1
0651	34 28.5°	120 50.8°	Lorac	4.6	1.6	0.3
1125	34 29.1°	120 52.5°	Lorac	5.4	1.3	0.2
1652	34 29.8°	120 53.8°	Lorac	0.7	0.2	0.3
1737	34 29.8°	120 53.7°	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 23 Depth 500 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0258/6	34 24.7°	120 50.8°	Radar	6.6	0.5	0.1
0932	34 25.2°	120 51.1°	Radar	4.4	1.3	0.3
1354	34 26.2°	120 50.3°	Lorac	1.9	0.2	0.1
1550	34 26.3°	120 50.2°	Lorac	3.8	0.2	0.1
1936	34 26.5°	120 50.0°	Lorac	0.9	0	0
2030	34 26.5°	120 50.0°	Lorac	2.9	0.6	0.2
2323	34 26.8°	120 50.5°	Lorac	2.0	0.6	0.3
0125/7	34 27.2°	120 51.0°	Lorac	3.5	0.9	0.3
0456	34 28.0°	120 51.3°	Lorac	1.8	0.2	0.1
0647	34 28.2°	120 51.5°	Lorac	4.5	0.8	0.2
1118	34 28.9°	120 51.9°	Lorac	5.4	0.7	0.1
1644	34 29.4°	120 52.3°	Lorac	1.1	0.1	0.1
1749	34 29.3°	120 52.4°	Lorac	5.0	0.4	0.1
2250	34 29.5°	120 52.9°	Lorac	6.8	1.0	0.1
0536/8	34 30.6°	120 52.7°	Lorac	6.3	0.8	0.1
1152	34 30.8°	120 51.7°	Lorac			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 24 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0334/6	34 28.3°	120 46.4°	Radar	5.4	1.7	0.3
0858	34 29.4°	120 48.0°		5.3	1.4	0.3
1115	34 30.4°	120 49.2°	Lorac	1.0	0.5	0.5
1514	34 30.6°	120 49.7°		4.0	1.4	0.4
1916	34 30.9°	120 51.5°	Lorac	4.8	2.9	0.6
0005/7	34 30.5°	120 54.9°		0.7	0.9	1.3
0048	34 30.7°	120 55.9°	Lorac	4.5	2.0	0.4
0520	34 29.0°	120 54.7°		1.1	1.2	1.1
0628	34 28.0°	120 54.1°	Lorac	4.2	3.6	0.9
1042	34 24.6°	120 52.7°		2.1	1.6	0.8
1251	34 24.2°	120 50.8°	Lorac	3.0	1.9	0.6
1552	34 24.1°	120 48.5°		2.9	1.6	0.6
1844	34 23.3°	120 46.8°	Lorac	2.9	1.4	0.5
2136	34 22.3°	120 45.7°		5.7	2.3	0.4
0321/8	34 20.8°	120 43.5°	Lorac	4.6	3.0	0.7
0758	34 18.1°	120 42.0°				

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 25 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0412/6	34 32.0°	120 42.0°	Radar	4.1	1.7	0.4
0819	34 33.0°	120 43.7°		6.4	5.4	0.8
1143	34 34.5°	120 50.0°	Lorac	4.9	2.7	0.6
1936	34 34.6°	120 53.3°		4.8	2.2	0.5
0027/7	34 33.7°	120 55.6°	Lorac	5.4	1.4	0.3
0551	34 32.4°	120 55.0°		6.0	2.8	0.5
1152	34 30.2°	120 57.0°	Lorac	5.3	0.8	0.2
1710	34 29.5°	120 56.9°		6.5	5.0	0.8
2340	34 25.4°	120 53.3°	Lorac	4.6	2.8	0.6
0418/8	34 25.2°	120 50.0°		2.4	1.7	0.7
0645	34 24.7°	120 48.0°	Lorac Radar			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 26 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0724/9	34 51.7°	121 01.4°	Radar	4.3	0.3	0.1
1140	34 51.6°	121 01.8°	Radar	2.7	0.4	0.1
1423	34 51.9°	121 01.7°	Radar	8.6	0.8	0.1
2300	34 52.0°	121 02.5°	Radar	2.2	0	0
0113/10	34 52.0°	121 02.5°	Radar	1.9	0.4	0.2
0306	34 52.3°	121 02.9°	Radar	2.0	0.4	0.2
0506	34 52.7°	121 03.1°	Radar	2.6	0.6	0.2
0745	34 52.9°	121 03.7°	Radar	4.6	0.5	0.1
1219	34 53.3°	121 03.4°	Radar			

DROGUE NO. 27 Depth 500 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0730/9	34 51.6°	121 01.3°	Radar	4.3	0.8	0.2
1150	34 52.4°	121 01.0°	Radar	2.5	0.4	0.2
1423	34 52.8°	121 01.0°	Radar	12.4	1.5	0.1
0245/10	34 54.2°	121 00.4°	Radar	3.0	0.7	0.2
0545	34 54.9°	120 59.9°	Radar	4.2	0.6	0.1
0957	34 54.9°	120 59.3°	Radar	3.0	0.4	0.1
1300	34 55.2°	120 58.9°	Radar			

CURRENT DROGUE SUMMARY SHEET

DROGUE NO. 28 Depth 50 ft. Month December Year 1964

Time/Day Zulu	Position		Type Control	Observation Interval		
	Lat. (N)	Long. (W)		Time (hr)	Dist. (nm)	Ave.Vel. (kts)
0800/9	34 53.7°	120 57.4°	Radar	4.2	0.2	0
1214	34 53.8°	120 57.2°	Radar	1.6	0.3	0.2
1352	34 53.7°	120 56.8°	Radar	1.4	0.6	0.4
1514	34 53.2°	120 56.1°	Radar	1.3	0.5	0.4
1634	34 52.9°	120 56.2°	Radar	2.2	0.8	0.4
1846	34 52.1°	120 56.6°	Radar	3.5	0.3	0.1
2217	34 52.0°	120 56.3°	Radar	2.1	0.2	0.1
0021/10	34 52.3°	120 56.3°	Radar	1.7	0.7	0.4
0205	34 52.4°	120 55.5°	Radar	2.0	0.7	0.4
0405	34 52.1°	120 54.8°	Radar	2.6	0.9	0.3
0642	34 51.3°	120 54.4°	Radar	4.3	0.6	0.1
1100	34 50.8°	120 54.0°	Radar			

U. S. Naval Oceanographic Office
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The main emphasis is on the currents,
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plankton summary tables, and current drogue
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U. S. Naval Oceanographic Office
1. Oceanographic Office
2. Point Arguello Area
3. Currents
4. Ships - USS REIDBOTH (AGS 50)

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11. Author: Robert W. Thomas
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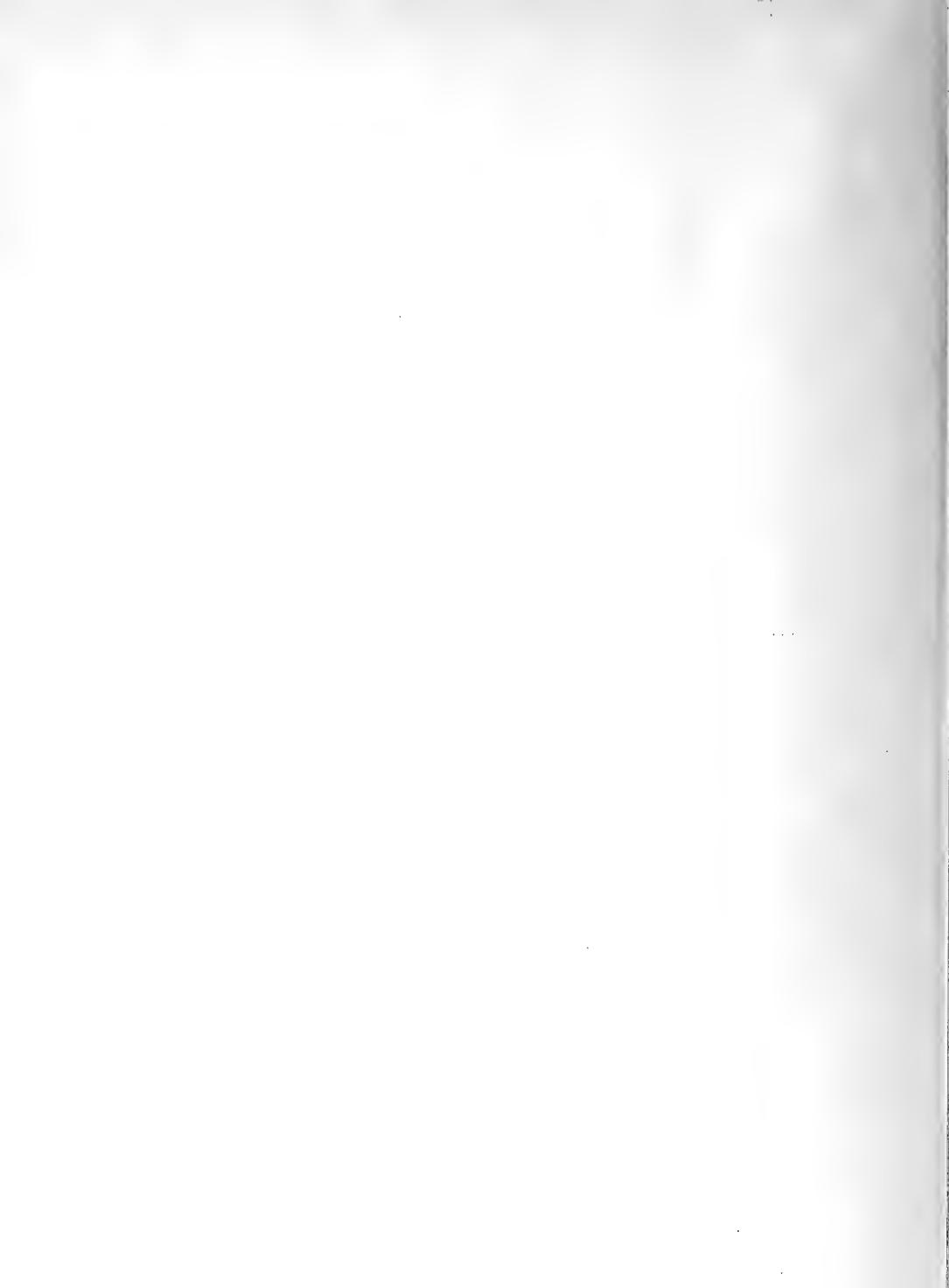
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13. ABSTRACT

NAVOCEANO conducted two oceanographic surveys in the ocean area off Point Arguello, California, one in January and one in November-December 1964. The primary purpose of the surveys was to investigate the currents of the area; however, standard Nansen casts were taken, and bottom sediment and plankton samples were obtained.

Parachute current drogues were principally used to describe current movement off Point Arguello. A strong westerly flow along the northern portion of Santa Barbara Channel was noted in the surface layers. A corresponding easterly flowing current also was noted in the southern portion of the channel.

The major features of the surface flow appeared to be a counterclockwise rotating eddy just off Point Arguello and a deflection of the California Current due to the influence of Rodriguez Dome.

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